2. $f(x) = \dfrac{(x^2-4)\ )P \quad P' = 2x}{(3x-1)\ )Q \quad Q' = 3}$

① $\dfrac{P'Q - PQ'}{Q^2}$

$$f'(x) = \frac{2x(3x-1) - (x^2-4)3}{(3x-1)^2}$$

$$= \frac{6x^2 - 2x - 3x^2 + 12}{(3x-1)^2}$$

$$f'(x) = \frac{3x^2 - 2x + 12}{(3x-1)^2} \quad \begin{matrix})P \\ )Q \end{matrix}$$

$P' = 6x - 2 \qquad Q' = 2(3x-1)^1 \cdot \frac{d}{dx}(3x-1)$

$= 2(3x-1) \qquad = 2(3x-1)\cdot 3$

$= 6(3x-1)$

$\dfrac{P'Q - PQ'}{Q^2}$

$$f''(x) = \frac{2(3x-1)(3x-1)^2 - (3x^2-2x+12)6(3x-1)}{[(3x-1)^2]^2}$$

$$= \frac{2(3x-1)[(3x-1)^2 - 3(3x^2-2x+12)]}{(3x-1)^4}$$

$$= \frac{2[(3x-1)(3x-1) - 9x^2 + 6x - 36]}{(3x-1)^3}$$

$$= \frac{2[9x^2 - 3x - 3x + 1 - 9x^2 + 6x - 36]}{(3x-1)^3}$$

$$= \frac{2[-35]}{(3x-1)^3}$$

$$f''(x) = \frac{-70}{(3x-1)^3}$$

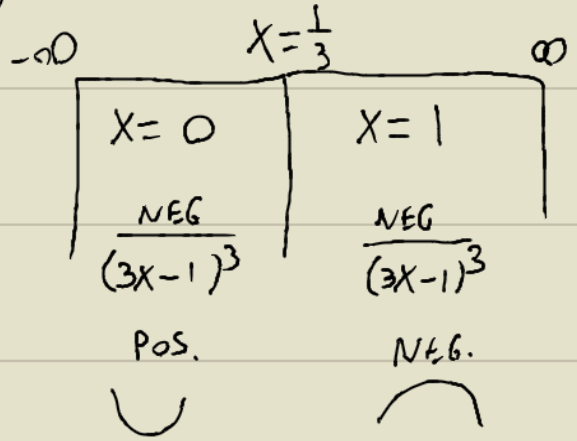
② $-70 \neq 0 \qquad (3x-1)^3 = 0$

$3x - 1 = 0$

$3x = 1$

$x = \frac{1}{3}$

③



CONC UP $(-\infty, \frac{1}{3})$

CONC DOWN $(\frac{1}{3}, \infty)$